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10/562,072	12/21/2005	Michael Andrew Yuratich	MRKS/0142	3875

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EXAMINER	
COMLEY, ALEXANDER BRYANT	
ART UNIT	**PAPER NUMBER**
3746	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/562,072	Applicant(s) YURATICH, MICHAEL ANDREW	
	Examiner ALEXANDER B. COMLEY	Art Unit 3746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 June 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *4-17 and 36-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *4-17 and 36-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 15th, 2010 has been entered.

Status of the Claims

2. Examiner acknowledges receipt of Applicant's amendments and arguments filed with the Office on June 15th, 2010 in response to Final Office Action mailed on March 15th, 2010. Per Applicant's response, Claims 4, 7, & 11 have been amended. Claims 36-38 have been newly-added. Claims 1-3 & 18-35 remain cancelled due to a prior restriction requirement. All other claims remain in their previously presented form. Consequently, Claims 4-17 and 36-38 now remain for prosecution in the instant application. The Examiner has carefully considered each of Applicant's amendments and/or arguments, and they shall be addressed below.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. **Claim 38** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant's phrasing of "the lowest associated current" is ambiguous as it is unclear what the current is actually associated with other than the 3-phase power source itself (Konecny provides a 3-phase power source that supplies current to a device). The application's specification does not appear to provide insight on such a type of current. Appropriate correction and clarification is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. **Claims 4-17 & 36-38** are rejected under 35 U.S.C. 102(b) as being anticipated by United States Patent No. 5,844,397 to Konecny et al.

In regards to Independent **Claim 4**, Konecny et al. discloses an improved downhole pumping system that employs a variable speed PWM (pulse-width modulated) inverter and transformer setup in order to <u>smoothly</u> and efficiently drive an induction (i.e. three-phase) motor over a range of different speeds. To begin, Konecny discloses a drive circuit for driving a submersible pump by stating, "The present invention relates to an improved downhole pumping system utilizing an electric motor. More particularly, the invention concerns a system for extracting fluids from a well by

using an induction motor coupled to a variable speed pulse width modulated (PWM) inverter (i.e. variable voltage source) via a non-gap transformer." (Col. 1, Lines 12-18) More specifically, Konecny discloses a means for generating cyclically varying waveforms by stating "The invention receives electrical power from a three phase power supply 602 (FIG. 6). Preferably, the power supply 602 provides an A.C. voltage waveform of about 380 or 480 A.C. volts (RMS), with a frequency of 50-60 Hz. The power supply 602 is electrically connected to a three phase full-wave rectifier 604, which receives the waveform provided by the power supply 602 and converts it into D.C. voltage." (Col. 4, Lines 58-65) Konecny also discloses the use of a PWM drive (i.e. upper and lower voltage levels) by stating "One approach that is used to develop rectangular voltage signals for PWM drives is the "sine-triangle" scheme. As shown in FIG. 3, this method designates high and low periods of a rectangular voltage signal 300 based upon the intersection between a triangular wave 302 having the desired chopping frequency (f.sub.PWM), and a sinusoidal signal 304 having the desired electrical driving frequency of the motor (f.sub..omega.). The rectangular signal 300 is (1) high when the sinusoidal signal 304 is greater than the triangular wave 302, and (2) low when the sinusoidal signal 304 is less than the triangular wave 302." (Col. 2, Lines 24-34) With particular reference to Figure 4 (as well as Col. 3, Lines 1-13), Konecny portrays how well-known PWM drives supply power to an electrical device to smoothly transition from high-voltage levels (peak of sine signal 404) to low-voltage levels (trough of sine signal 404). It can be seen in Figure 4 that as the rectangular voltage signals increase (i.e. get wider), the sinusoidal voltage signal smoothly transitions to a maximum voltage.

Contrastingly ,as the rectangular voltage signals decrease (i.e. get narrower), the sinusoidal voltage signal smoothly transitions to a minimum voltage level. Extended periods of substantially continuous voltage can be seen at each of the maximum and minimum voltage levels of the sinusoidal signal. Hence, Figure 4 appears to clearly show how PWM systems are known to smoothly transition between high and low voltage levels. Moreover, it is clear that the PWM drive circuit utilizes high and low voltage levels for different periods of time in order to drive the motor at different speeds. Most importantly, however, is Konecny's disclosure of smoothing circuits designed to eliminate voltage harmonics (i.e. transient voltage spikes) sometimes present in PWM drives in order to even more smoothly transition from high voltage levels to low voltage levels. To begin, Konecny states "Although PWM drives provide a number of benefits, such as avoiding the potentially damaging harmonic frequencies generated by six step drives, conventional PWM drives may present certain problems in some applications. One problem is that PWM drives generate direct current (D.C.) offsets due to slight switching time biases and a beat-like phenomenon between the fundamental frequency and the chopping frequency. These small offsets will saturate a non-gapped transformer." (Col. 3, Lines 1-8) Konecny then states "The rectifier 604 provides a D.C. voltage of about 537 or 680 volts, depending upon whether the voltage of the power supply 602 is 380 or 480 A.C. volts, respectively. The rectifier 604 is electrically connected to a smoothing circuit 606, which reduces ripples in the voltage provided by the rectifier 604. An inverter 608 receives the smoothed D.C. signal from the smoothing circuit 606 and provides a three phase signal to the motor 600 via a transformer 610.

The inverter 608 provides a PWM signal, which may be varied according to inputs from a controller 612, thereby adjusting the frequency of rotation of the motor 600." (Col. 4, Line 65 - Col. 5, Line 8) Hence, it is apparent that Konecny's system utilizes a smoothing circuit for smoothing the voltage signals that are input to the inverter (i.e. PWM generator) such that a 'balanced' PWM signal can accurately drive the electric motor of the pump. Therefore, Konecny's system provides a driving circuit for a submersible pump in which the input voltages of the driving waveforms are substantially smoothly transitioned (i.e. sinusoidal) from upper levels to lower levels in order to efficiently control the rotational speed of the motor via a three-phase output means.

6. In regards to dependent **Claims 5-6**, it is clear that Konecny's three-phase power supply 602 drives all phases (3 phases) of the motor simultaneously, and moreover, that the variable voltage supply is switched between upper and lower voltage levels (See Col. 2, Lines 13-34) Similarly, in regards to dependent **Claims 7-8 & 10-13**, Konecny's invention is specifically aimed at providing a pulse-width-modulated time-dependent sequence in order to smooth out the voltage transitions through a range of different motor speeds (i.e. high speeds). (See Col. 2, Lines 13-34; Col. 3, Lines 42-51; Col. 4, Line 58- Col. 5, Line 8; Abstract) Konecny also specifically states that the frequency of the variable voltage source is varied with the output of a chopping mechanism by stating "The motor may be started by ramping flux producing current to a first preset value at a low frequency, then ramping torque producing current to a second preset value. If a flux measurement indicates the motor has stalled, the second preset

value is increased, and the routine is restarted. Otherwise, if no stall has occurred, the motor's speed is ramped to the desired value. Ongoing operation of the motor is managed by a drive routine, which generates triangular and sinusoidal signals based upon a desired chopping frequency, as well as a desired driving frequency of the motor. (Abstract) Regarding dependent **Claim 9**, Konecny clearly discloses the use of a filter in Figures 6-7 (Also see Col. 5, Lines 33-56) In regards to dependent **Claims 14-15**, and with particular reference to Figure 7A-1, Konecny discloses the use of two capacitors (706, 708) connected to first and second supply voltage sources (701, 702), and selections means (705) designed to selectively vary the voltage (based on the duty cycle) supplied by the buses (701, 702) (See Col. 5, Lines 44-67) Regarding dependent **Claim 16**, the transformer of Konecny's drive circuit acts as a poly-phase boost converter (i.e. step-up converter). In particular, Konecny states "Typically, the variable speed drive and a drive controller of a selected type are operatively connected between the power line and a transformer. The transformer is utilized to drive the motor, and more particularly to step up the level of voltage and reduce the current supplied to the motor. This is especially important in applications such as downhole pumping operations, where a long cable connects the transformer to the motor; in these situations, the transformer helps prevent excessive current from flowing in the long cable." (Col. 1, Lines 53-61) And finally, regarding dependent **Claim 17**, Konecny specifically discloses a transformer with first and second windings (See Col. 6, Lines 35-57). In regards to dependent **Claims 36-38**, Figure 4 shows how the sinusoidal voltage signal varies substantially smoothly during transitions between upper and lower voltage

levels provided from a 3-phase power source. Moreover, it can be seen that the PWM drive circuit utilizes high and low voltage levels for different periods of time in order to drive the motor at different speeds. In particular, extended periods of substantially continuous voltage can be seen at each of the maximum and minimum voltage levels of the sinusoidal signal (areas outside of the peaks do not maintain constant voltage for any real length of time, relatively speaking).

Response to Arguments

7. Applicant's arguments filed June 15th, 2010 have been fully considered but they are not persuasive. The Examiner's responses can be seen below.

8. As described in the analysis for Independent Claim 4 above, Konecny discloses the use of a PWM drive (i.e. upper and lower voltage levels) by stating “One approach that is used to develop rectangular voltage signals for PWM drives is the "sine-triangle" scheme. As shown in FIG. 3, this method designates <u>high and low periods of a rectangular voltage signal</u> 300 based upon the intersection between a triangular wave 302 having the desired chopping frequency (f.sub.PWM), and a sinusoidal signal 304 having the desired electrical driving frequency of the motor (f.sub..omega.). The rectangular signal 300 is (1) high when the sinusoidal signal 304 is greater than the triangular wave 302, and (2) low when the sinusoidal signal 304 is less than the triangular wave 302.” (Col. 2, Lines 24-34) With particular reference to Figure 4 (as well as Col. 3, Lines 1-13), Konecny portrays how well-known PWM drives supply power to

an electrical device to smoothly transition from high-voltage levels (peak of sine signal 404) to low-voltage levels (trough of sine signal 404). It can be seen in Figure 4 that as the rectangular voltage signals increase (i.e. get wider), the sinusoidal voltage signal (which simulates the input voltage level) smoothly transitions to a maximum voltage. Contrastingly, as the rectangular voltage signals decrease (i.e. get narrower), the sinusoidal voltage signal smoothly transitions back down to a minimum voltage level. Extended periods of substantially continuous voltage can be seen at each of the maximum and minimum voltage levels of the sinusoidal signal. Hence, Figure 4 appears to clearly show how PWM systems are known to smoothly transition between high and low voltage levels. Moreover, it is clear that the PWM drive circuit utilizes high and low voltage levels for different periods of time in order to drive the motor at different speeds. Konecny's disclosure of <u>smoothing circuits</u> designed to eliminate voltage harmonics (i.e. transient voltage spikes) sometimes present in PWM drives in order to even more smoothly transition from high voltage levels to low voltage levels acts to even further smooth the voltage level transitions. The Examiner must assert that such a disclosure from Konecny shows that known PWM systems (as well as Konecny's invention) smoothly transition between high and low voltage levels.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEXANDER B. COMLEY whose telephone number is (571)270-3772. The examiner can normally be reached on M-F 7:30am - 5:00am EST

(Alternate Fridays Off). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Devon C. Kramer can be reached on (571)-272-7118. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Alexander B Comley/
Examiner, Art Unit 3746

/Charles G Freay/
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ABC